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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,152	12/15/2003	Kenneth Richard Astley	114673	2080
25944	7590	01/04/2005	EXAMINER	
OLIFF & BERRIDGE, PLC P.O. BOX 19928 ALEXANDRIA, VA 22320			LE, JOHN H	
			ART UNIT	PAPER NUMBER
			2863	

DATE MAILED: 01/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/734,152

Applicant(s)

ASTLEY ET AL.

Examiner

John H Le

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/15/03 (Preliminary Amendment).
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6,9 and 11-14 is/are rejected.
- 7) ☒ Claim(s) 7,8 and 10 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 15 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>12/15/03 & 01/16/04</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The abstract of the disclosure is objected to because of the form and legal phraseology often used in patent claims, such as "comprises" and "said" should be avoided.
2. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Drawings

3. The drawings of Figs.1-10 are objected to because lines, numbers, and letters not uniformly thick and well defined, clean, durable, and black (poor line quality). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement-drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining

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figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshioka et al. (USP 5,811,683).

Regarding claim 1, Yoshioka et al. disclose a method for locating bearing anomalies in machinery (Fig.1), comprises: receiving vibration measurements acquired from the machinery (Fig.1, vibration acceleration sensors 7, 8, and 11, Col.3, lines 12-33), analyzing the vibration measurements to identify novel tracked orders indicative of: bearing anomalies, and ascertaining the location of a bearing anomaly (e.g. Col.7, lines14-25) by relating a novel tracked order thus-identified to one or more further tracked orders (e.g. Col.4, lines 7-9, lines 62-65, Col.5, lines 10-12, Col.6, lines 58-64, Figs.8-9, Col.5, lines 29-45).

Regarding claim 2, Yoshioka et al. disclose tracked orders comprise at least one side band to the novel tracked order (e.g. Figs. 12A-12B, Col.41-64).

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Regarding claim 3, Yoshioka et al. disclose tracked orders comprise a tracked order associated with a component supported by the anomalous bearing (e.g. 14-29).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 4, 5, 11, 12, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshioka et al. (USP 5,811,683) in view of Bently (USP 6,092,029).

Regarding claims 4 and 14, Yoshioka et al. disclose a method for detecting bearing anomalies in machinery (Fig.1), comprises performing at each of a plurality of times the steps of: constructing a condition signature from a plurality of condition indicators including (a) a plurality of vibration measurements acquired from the machinery or (b) one or more vibration measurements and one or more performance parameter measurements acquired from the machinery (Fig.1, vibration acceleration sensors 7, 8, and 11, Col.3, lines 12-33), registering a bearing anomaly if the condition signature differs from the normal signature by more than a predetermined threshold (e.g. Col.7, lines 7, lines 14-29).

Yoshioka et al. fail to disclose predicting a normal signature corresponding to the condition signature for the machinery without bearing anomalies; comparing the condition signature with the normal signature.

Bently teaches predicting a normal signature corresponding to the condition signature for the machinery without bearing anomalies (standard condition); comparing the condition signature with the normal signature (e.g. Fig.1, Abstract, Col.5, lines 10-14, lines 40-50).

Regarding claim 5, Bently teaches the normal signature is predicted from a model defining one or more inter-dependencies between the condition indicators (e.g. Col.3, lines 52-59).

Regarding claim 11, Yoshioka et al. teaches wherein said times define successive intervals of at most 1 sec duration (e.g. Col.6, line 15).

Regarding claim 12, Bently teaches the machinery comprises a gas turbine engine (Fig.7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to inform predicting a normal signature corresponding to the condition signature for the machinery without bearing anomalies; comparing the condition signature with the normal signature as taught by Bently in a method for detecting bearing anomalies in machinery of Yoshioka et al. for the purpose of providing a new, novel and useful method and apparatus for diagnosing and correcting rotating stall and surge effects in rotating machinery (Bently, Col.3, lines 11-14).

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Regarding claim 13, Yoshioka et al. disclose a processor (computer simulation, Col.4, lines 1-2) for analyzing the vibration measurements to identify novel tracked orders indicative of: bearing anomalies, and ascertaining the location of a bearing anomaly (e.g. Col.7, lines 14-25) by relating a novel tracked order thus-identified to one or more: further tracked orders (e.g. Col.4, lines 7-9, lines 62-65, Col.5, lines 10-12, Col.6, lines 58-64, Figs.8-9, Col.5, lines 29-45).

Yoshioka et al. fail to disclose a data receiver for receiving vibration measurements acquired from the machinery.

Bently teaches a data receiver (data acquisition 30) for receiving vibration measurements acquired from the machinery (e.g. Col.7, lines 1-5).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a data receiver for receiving vibration measurements acquired from the machinery as taught by Bently in a method for detecting bearing anomalies in machinery of Yoshioka et al. for the purpose of providing a new, novel and useful method and apparatus for diagnosing and correcting rotating stall and surge effects in rotating machinery (Bently, Col.3, lines 11-14).

8. Claims 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshioka et al. (USP 5,811,683) in view of Bently (USP 6,092,029) as applied to claim 4 above, and further in view of Nida et al. (USP 5,402,521).

Regarding claim 6, the combination of Yoshioka et al. and Bently discussed supra, disclose the claimed invention except the model is a learnt model.

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Nida et al. disclose a learnt model (e.g. Fig.2, Abstract, Col.2, lines 26-46).

Regarding claim 9, Nida et al. disclose the model comprises a neural network (Fig.2).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to inform a learnt model as taught by Nida et al. in a method for detecting bearing anomalies in machinery of Yoshioka et al. in view of Bently for the purpose of providing a method for recognition of normal and abnormal conditions using neural network.

Allowable Subject Matter

9. Claims 7-8 and 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 7, none of the prior art of record teaches or suggests the combination of a method for detecting bearing anomalies in machinery, wherein the method comprises performing at each of a plurality of times the steps of: constructing a condition signature from a plurality of condition indicators including (a) a plurality of vibration measurements acquired from the machinery or (b) one or more vibration measurements and one or more performance parameter measurements acquired from the machinery; predicting a normal signature corresponding to the condition signature for the machinery without bearing anomalies; comparing the condition signature with the normal signature; and

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registering a bearing anomaly if the condition signature differs from the normal signature by more than a predetermined threshold; wherein the normal signature is predicted from a model defining one or more inter-dependencies between the condition indicators; wherein the model comprises a matrix with one or more non-zero off-diagonal terms to define said inter-dependencies. It is these limitations as they are claimed in the combination with other limitations of claim, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Regarding claim 10, none of the prior art of record teaches or suggests the combination of a method for detecting bearing anomalies in machinery, wherein the method comprises performing at each of a plurality of times the steps of: constructing a condition signature from a plurality of condition indicators including (a) a plurality of vibration measurements acquired from the machinery or (b) one or more vibration measurements and one or more performance parameter measurements acquired from the machinery; predicting a normal signature corresponding to the condition signature for the machinery without bearing anomalies; comparing the condition signature with the normal signature; and registering a bearing anomaly if the condition signature differs from the normal signature by more than a predetermined threshold; wherein the normal signature is predicted from a model defining one or more inter-dependencies between the condition indicators; wherein the model comprises a neural network; and wherein the step of comparing the condition signature with the normal signature involves calculating a prediction error. It is these limitations as they are

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claimed in the combination with other limitations of claim, which have not been found, taught or suggested in the prior art of record, that make these claims allowable over the prior art.

Contact Information

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John H Le whose telephone number is 571-272-2275. The examiner can normally be reached on 8:00 - 4:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E Barlow can be reached on 571-272-2269. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

John H. Le

Patent Examiner-Group 2863

December 23, 2004


John Barlow
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